Direct versus Facility Centric Load Control for Automated Demand Response

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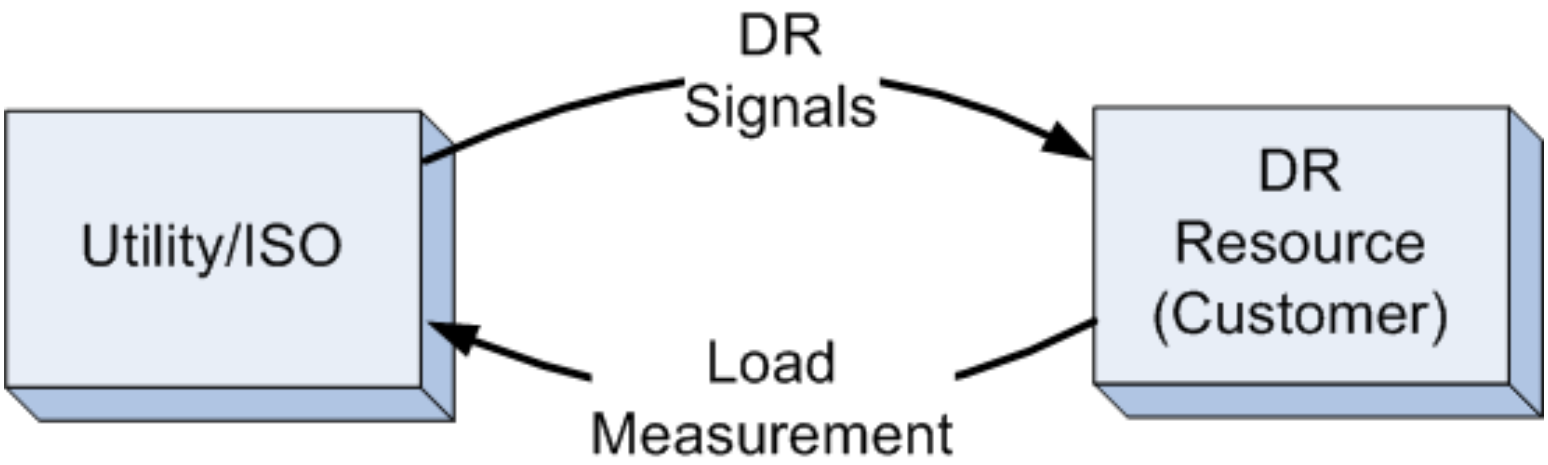
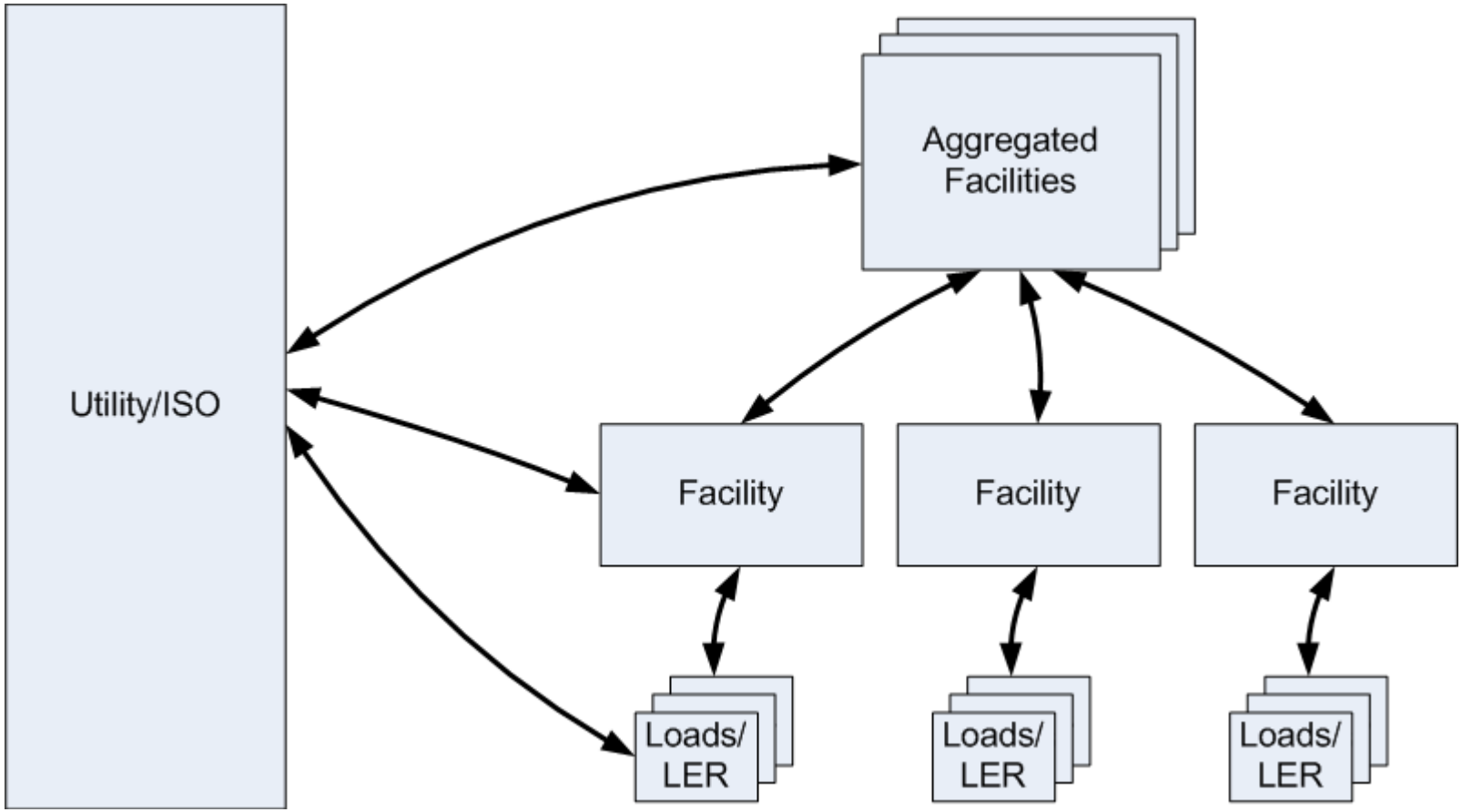
Simple Interaction Model



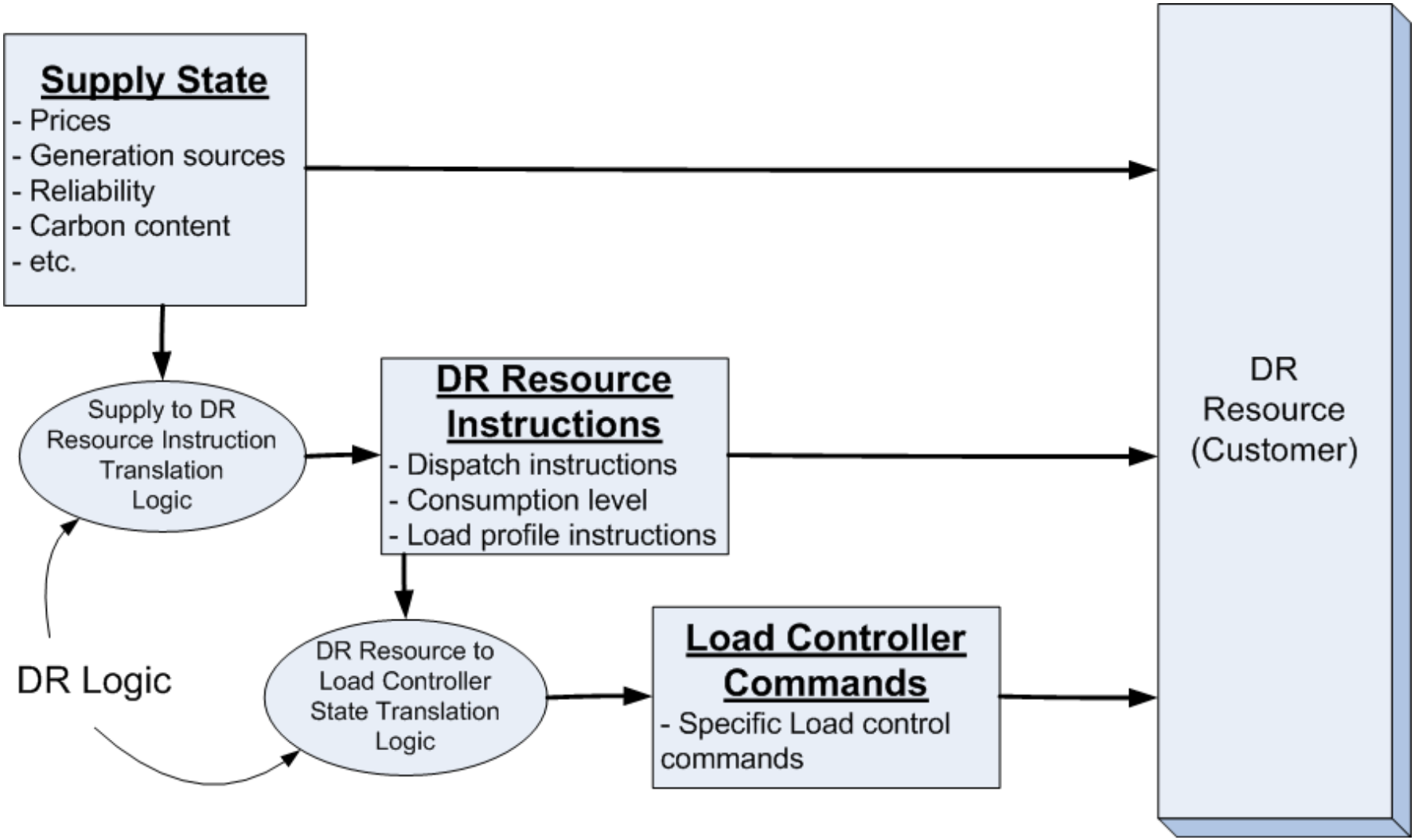
DR Resource Hierarchy



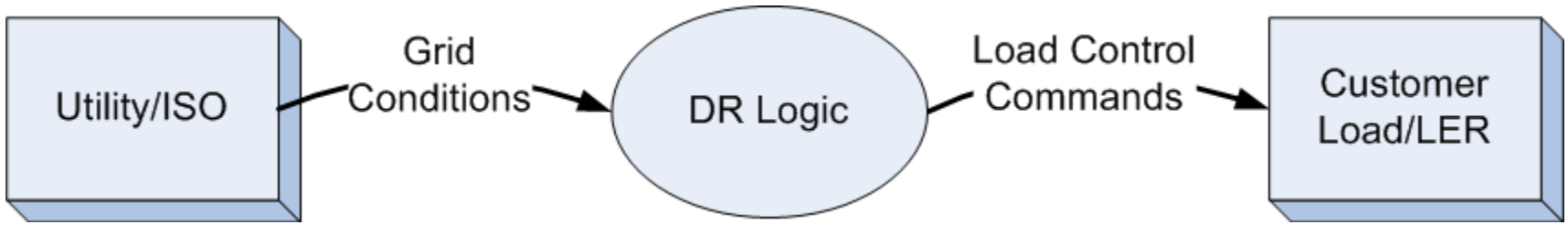
DR Signal Types

- **Supply State**
  - Prices
  - Generation sources
  - Reliability
  - Carbon content, etc.
- **DR Resource Instructions**
  - Dispatch instructions
  - Consumption level
  - Load profile instructions
- **Load Controller Commands**
  - Specific Load control commands

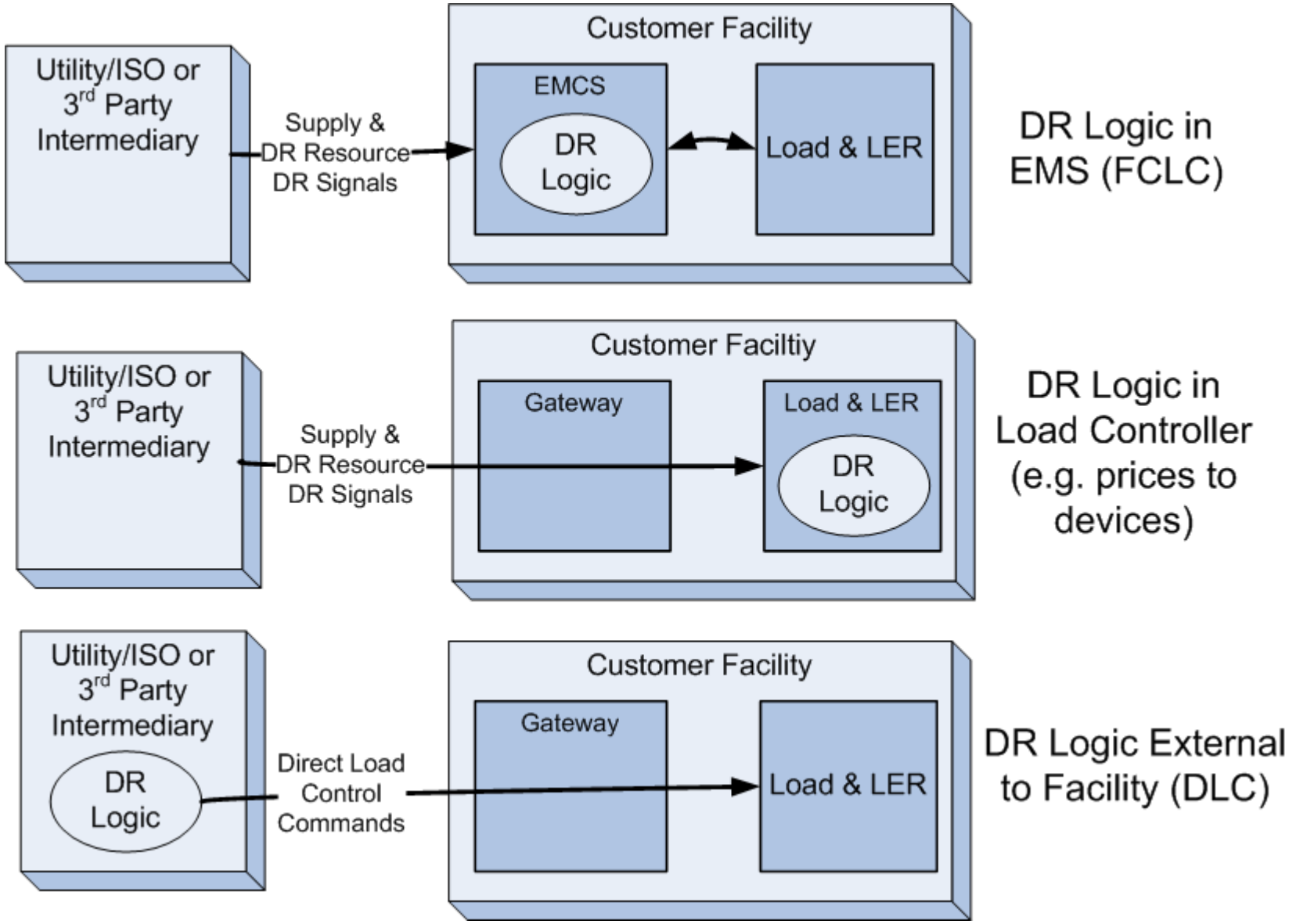
Interaction Mode Hierarchy



DR Logic Concept



Definition of FCLC and DLC with Respect to Location of DR Logic



FCLC versus DLC

- Load Profile
  - Effect of DLC on load profiles is more predictable from the Utility/ISO perspective
  - DR Resource that utilizes FCLC is more reliable than a single load controlled by DLC
- Facility
  - More flexibility and customer choice with FCLC
  - FCLC adds equipment costs and operator responsibilities
- Utility/ISO
  - DLC requires managing the communications with both a larger range and number of different devices which adds complexity to the Utility/ISO IT systems
  - DLC requires doing some sort of aggregated load control in order to get the same benefits of FCLC

Relevant Standards Efforts

- NIST Smart Grid Roadmap
  - PAP 03 – Price representation
  - PAP 04 – scheduling
  - PAP 09 – DR Signals
- OpenADR Specification
- Organization for the Advancement of Structured Information Standards (OASIS)
  - Energy Interoperation TC
  - Energy Market Information Exchange TC (eMIX)
- NASESB Smart Grid Standards Task Force
- IEC 61968 (CIM)
- IEC 61850
- Zigbee/Homeplug Alliance - Smart Energy Profile (SEP) versions 1.0 and 2.0
- Multispeak